7. Utility Codes

Several utility codes are provided for pre-processing, running, monitoring, and post-processing solutions with OVERFLOW. These utility codes are compiled using the Maketools make file or the makeall script. The following codes are provided:

Preprocessing tools:

addbb	Add an additional (7th) variable onto a (single or multiple grid) PLOT3D Q file, corresponding to $\tilde{\nu}/\nu_\infty$, the field variable for the Baldwin-Barth or Spalart-Allmaras one-equation turbulence models. Value is initialized to 0.1, the default free stream value (**RETINF** in the NAMELIST input).
addgam	Program addgam reads a PLOT3D Q file and adds a constant gamma field to it, as used in OVERFLOW. Output is a PLOT3D Q file suitable to use as a restart or BCFILE file.
addke	Add additional (7th & 8th) variables onto a (single or multiple grid) PLOT3D Q file, corresponding to rho*k and rho*ω, the field variables for the *k-ω* two-equation turbulence model. Values are initialized to $k/V_{\mathrm{Re}\,f}^2 = 0.0001$, and ω such that the eddy viscosity at infinity is set to $\mu_t/\mu_\infty = 0.1$. These are the default free stream values.
changeq	The changeq program reads in a OVERFLOW Q file and allows the user to change any subset of any Q field to a constant value. This is useful to set modify existing Q data for BCFILE boundary conditions.
endian_convert	Converts Fortran unformatted files between big- and little-endian. Applies to grid, Q, and XINTOUT files.
find_y	Program to find initial spacing in the normal (viscous) direction, given the Reynolds number and distance downstream at which a y^+=1 is desired. This program uses the simple form of flat plate skin friction estimation, which does not include temperature effects. It is appropriate for subsonic through transonic (air) flows. It is assumed that Re and the distance downstream (x) are both supplied in "grid units." The returned value of y is then also in grid units. We assume normal AIR properties.
find_y2	Program to find initial spacing in the normal (viscous) direction, given the Reynolds number and distance downstream at which a y^+=1 is desired. Also required are the Mach number and free stream temperature (deg R). This program uses the more sophisticated form of flat plate skin friction estimation of Sommer and Short, which includes temperature effects. It is appropriate for supersonic flows. It is assumed that Re and the distance downstream (x) are both supplied in "grid units." The

	returned value of y is then also in grid units. We assume normal air properties.
gaschem	The program GASCHEM computes the Cp/R polynomial coefficients required to run the variable gamma options of the OVERFLOW code. The program reads the following input for each gas: Chemical species symbol Molecular weight of chemical species Mass fraction of chemical species The code will use the chemical species symbol to search the database (fort.4) for a match. Thus it is IMPERATIVE that the symbols match down to the character. This database is derived from the NASA Lewis CEC-80 (Chemical Equilibrium Chemistry - 1980) database. Program output is a file containing input echo and polynomial coefficients for the variable gamma options, and a gamma vs. temperature table for plotting purposes.
grid32_to_64/grid64_to_32	Converts a single- or multiple-grid PLOT3D grid file from REAL*4 to REAL*8 and vice versa (integers remain *4).
intout_to_xintout	Convert a DCF (OVERFLOW-D style) INTOUT file to a PEGASUS style XINTOUT file.
q32_to_64/q64_to_32	Converts a single- or multiple-grid OVERFLOW Q file from REAL*4 to REAL*8 and vice versa (integers remain *4).
turb_init	Convert a Q file from a 1-equation turbulence model to a 2-equation turbulence model, or vice-versa.
xintout32_to_64/xintout64_to_32	Converts a PEGASUS XINTOUT file from REAL*4 to REAL*8 and vice versa (integers remain *4).
xrays32_to_64/xrays64_to_32	Converts a DCF X-Ray file from REAL*4 to REAL*8 and vice versa (integers remain *4).

Execution tools:

livePlot_p3d	script to view the residual/turb.out file as overflow is running
overrun	Unix script to run OVERFLOW and keep a history of run information, residuals, force and moments, and minimum density and pressure.
overrunmpi/overrunmpi_nolocal	Similar to OVERRUN, but runs the OVERFLOWMPI executable on multiple machines using MPI. OVERRUNMPI_NOLOCAL supports the no local option of mpich1 and already has the -nolocal flag set.
tellme	Unix script for echoing a message from a batch job to an interactive terminal of the same user.

Postprocessing tools:

bbplot	Generate "fake Q file" for plotting, containing (Ret,1,1,1,1) for a 1-eq turbulence model, or (k,w,1,1,1) for a 2-eq model. (These just take the field data directly from the Q array, with no additional scaling.)
cfwf	Calculates surface skin friction and heat transfer coefficients.
checkq	Reads "q.save" and prints a summary of min/max density, pressure, temperature and Mach number per grid.
fvbnd	Creates an fvbnd file for FieldView or Tecplot from a grid.in file and an OVERFLOW namelist input file.
listq	This lists values of Q in a specified subset.
mergem	Produce simple min rho/p history plotting file from OVERFLOW rpmin.out-type file. (See OVERPOST.)
merger	Produce simple flow solver residual history plotting file from OVERFLOW resid.out-type file. (See OVERPOST.)
merges	Produce simple species continuity residual history plotting file from OVERFLOW species.out-type file. (See OVERPOST.)
merget	Produce simple turbulence residual history plotting file from OVERFLOW turb.out-type file (1- and 2-equation turbulence models only). (See OVERPOST.)
overpost	Unix script to summarize residual, min rho/p, turbulence residual, and species continuity residual files into simple files plottable by the (unsupported) utility "xyplot". (Local plotting utilities ought to be able to handle the same or similar files!) OVERPOST uses FORTRAN utilities MERGEM,R,T,S.
outline_ob	Program to generate a PLOT3D command file to outline off-body grids, color-coded by their grid level.
overclean	Unix script to clean up (delete) log, resid, fomoco, rpmin, turb, and species files for a specified collection of runs.
subs_ob	Program to generate a PLOT3D command file to set off-body grid subsets for a given x, y, or z=constant plane.
vgplot	The vgplot program reads in OVERFLOW solution files from OVERFLOW and write out fake Q file(s) based on which option was used. For the 2-gas mixing based on enthalpy option, Fake Q file 1 : [pres, temp, mach, stagnation enthalpy, gamma] For the SCE option, Fake Q file 1 : [pres, temp, mach, stagnation enthalpy, gamma]

	Fake Q file 2 : [c1, c2, c3,c4,c5]
xysift	Program to "thin" the input history plotting file.
xysplit	Program to split the input history plotting file into files with no more than 10 curves per file.